N 536 - Utilization of Nursing Research in Advanced Practice, Summer 2008

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Design Characteristics

- Maximizes control over factors to increase the validity of the findings
- Guides the researcher in planning and implementing a study
Level of Control: Quantitative Research

- Descriptive
- Correlational
- Quasi-experimental
- Experimental

Increased Control with Design
Concepts Relevant to Research Design (1)

Causality

A \[ \rightarrow \] B
Pressure \[ \rightarrow \] Ulcer

Multicausality

Years smoking \[ \rightarrow \] Heart disease
High fat diet \[ \rightarrow \] Heart disease
Limited exercise \[ \rightarrow \] Heart disease
- Probability: Likelihood of an outcome
- Bias: Slanting findings
- Manipulation: Treatment
- Control: All phases of design
Design Validity

- Measure of accuracy of a study

- Examined with critique of the following dimensions:
  - Statistical conclusion validity
  - Internal validity
  - Construct validity
  - External validity
Elements of a Strong Research Design (1)

- Controlling the environment of the study setting

- Levels of controlling:
  - Natural setting
  - Partially controlled setting: e.g., clinics
  - Highly controlled setting: e.g., laboratory
Elements of a Strong Research Design (2)

- Controlling the equivalence of subjects and groups
  - Random subject selection
  - Random assignment to groups
Elements of a Strong Research Design (3)

- **Controlling the treatment**
  - Choose a treatment based on research and practice
  - Develop a protocol for implementation
  - Document the implemented treatment
  - Use a check-list to determine the extent of completeness to which the treatment was implemented
  - Evaluate the treatment during the study
Elements of a Strong Research Design (4)

- Controlling measurement
  - Reliability
  - Validity
  - Number of measurement methods
  - Types of instruments
Elements of a Strong Research Design (5)

• Controlling extraneous variables
  o Identify and eliminate extraneous variables via sample criteria, choice of settings, or research design
  o Random sampling
  o Sample: Heterogenous, homogeneous, or matching
  o Statistical control
Problems with Study Designs

- Inappropriate for the study purpose or the research framework
- Poorly developed designs
- The research methods were poorly implemented
- Inadequate treatment, sample, or measurement methods
Selecting a Design

Is there a treatment?

No

Is the primary purpose examination of relationships?

No

Descriptive Design

Will the sample be studied as a single group?

No

Correlational Design

Yes

Quasi-Experimental Study

Is the treatment tightly controlled by the researcher?

No

Yes

Will a randomly assigned control group be used

No

Is the original sample randomly selected?

No

Yes

Experimental Study
Selecting a Descriptive Design

Examining sequences across time?

- Yes
  - Following same subjects across time?
    - Yes
      - Single unit of study
    - No
      - Studying events partitioned across time?
        - Yes
          - Case Study
        - No
          - Trend Analysis

- No
  - One Group?
    - Yes
      - Descriptive Design
    - No
      - Comparative Descriptive Design

Research Design
Cross-sectional design with treatment partitioning
Longitudinal design with treatment partitioning
A Typical Descriptive Design

Clarification ➔ Measurement ➔ Description ➔ Interpretation

Phenomenon of Interest

Variable 1 ➔ Description of Variable 1
Variable 2 ➔ Description of Variable 2
Variable 3 ➔ Description of Variable 3
Variable 4 ➔ Description of Variable 4

Interpretation of Meaning ➔ Development of Hypotheses
A Comparative Descriptive Design

Group I
{variables measured}

Group II
{variables measured}

Describe

Comparison of Groups on Selected Variables

Interpretation of Meaning

Development of Hypotheses
Selecting the Type of Correlational Design

Describe relationships between/among variables?
- Descriptive correlational design

Predict relationships between/among variables?
- Predictive correlational design

Test theoretically proposed Relationships?
- Model testing design

Research Design
A Descriptive Correlational Design

Measurement

Research Variable 1

Description of variable

Examination of Relationship

Interpretation of Meaning

Development of Hypotheses

Research Variable 2

Description of variable
A Predictive Design

\[
\text{Value of Intercept} + \text{Value of Independent Variable 1} + \text{Value of Independent Variable 2} = \text{Predicted Value of Dependent Variable}
\]
Selecting The Type of Quasi-Experimental Design

- Control Group?
  - No
  - Pretest?
    - No
    - One-group post-test only design
    - Comparison with population values?
      - No
        - Suggest Reevaluating design
        - One group pretest/post-test design
      - Yes
        - Compare treatment & control conditions?
    - Yes
      - Repeated Measures?
        - No
          - Strategy for Comparison
        - Yes
          - Yes
            - Yes
  - Yes
    - Pretest?
      - No
        - One-group post-test only design
      - Yes
        - Repeated Measures?
Selecting The Type of Experimental Design

Pretest

No
Post-test only control group design

Yes
Repeated Measurements?

No
Examine effects of confounding variables?

No
Multiple sites?

Pretest/post-test control group design

Randomized clinical trials

No
Comparison of multiple levels of treatment

No
Examination of complex relationships among variables in relation to treatment

Yes
Repeated measures design

Yes
Blocking?

Yes
Randomized Block Design

Yes
Nested Designs
Pretest-Post Test, Control Group Designs

<table>
<thead>
<tr>
<th>Randomly selected experimental group</th>
<th>Measurement of dependent variables</th>
<th>Manipulation of independent variables</th>
<th>Measurement of dependent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected control group</td>
<td>PRETEST</td>
<td>TREATMENT</td>
<td>POST-TEST</td>
</tr>
<tr>
<td>Treatment:</td>
<td>Under control of researcher</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Findings:</td>
<td>Comparison of pretest and post-test scores</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uncontrolled threats to validity:</td>
<td>Testing Mortality</td>
<td></td>
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<tr>
<td>Instrumentation Restricted generalizability as control increases</td>
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</tbody>
</table>
## Post-Test-Only Control Group Design

<table>
<thead>
<tr>
<th>Randomly selected experimental group</th>
<th>TREATMENT</th>
<th>POST-TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected control group</td>
<td></td>
<td>POST-TEST</td>
</tr>
</tbody>
</table>

### Measurement
- Measurement of independent variables
- Measurement of dependent variables

### Treatment
- Under control of researcher

### Findings
- Comparison of experimental and control groups

### Example

### Uncontrolled threats to validity
- Instrumentation
- Mortality
- Limited generalizability as control increases
## Pain Control Management

<table>
<thead>
<tr>
<th>Traditional care</th>
<th>PRN Medication</th>
<th>New approach: “Around the clock” medication</th>
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</thead>
<tbody>
<tr>
<td>Unit A</td>
<td>Unit B</td>
<td>Unit E</td>
</tr>
<tr>
<td>Unit B</td>
<td>Unit C</td>
<td>Unit F</td>
</tr>
<tr>
<td>Unit C</td>
<td>Unit D</td>
<td>Unit G</td>
</tr>
<tr>
<td>Unit D</td>
<td></td>
<td>Unit H</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Primary Nursing Care</th>
<th>Primary Care</th>
<th>No Primary Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit A</td>
<td></td>
<td></td>
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<tr>
<td>Unit B</td>
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Advantages of Experimental Designs

- More controls in design and conducting a study
- Increased internally validity
  - Decreased threats to design validity
- Fewer rival hypotheses
Advantages of Quasi-Experimental Designs

- More practical
  - Ease of implementation
- More feasible
  - Resources, subjects, time, setting
- More generalizable
  - Comparable to practice
Developing the Design Section of Your Proposal

- Identify the design
  - Name it specifically

- Provide a map of the design
- Discuss your rationale for using this design
- Describe threats to the validity of the chosen design